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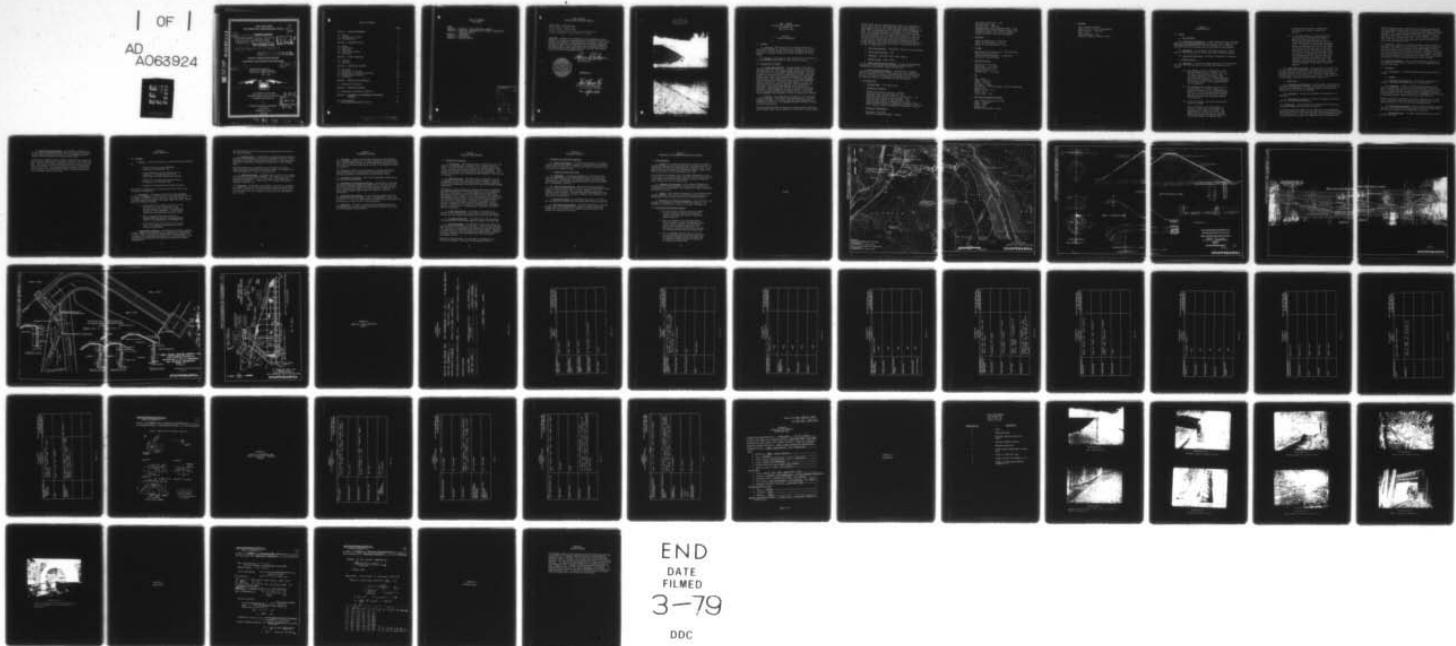
NATIONAL DAM SAFETY PROGRAM. BIG SPRING DAM (NDS I.D.-461), OHI--ETC(U)

DACW31-78-C-0049

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OHIO RIVER BASIN  
BIG SPRING RUN, WESTMORELAND COUNTY

⑥ **PENNSYLVANIA**

National Dam Safety Program. Big Spring Dam (NDS I.D.-461), Ohio River Basin, Big Spring Run, Westmoreland County, Pennsylvania. Phase I Inspection Report.

⑦ **LEVEL**

**BIG SPRING DAM**

⑮ **DACW 31-78-C-0049**

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**PHASE I INSPECTION REPORT**

**NATIONAL DAM INSPECTION PROGRAM**

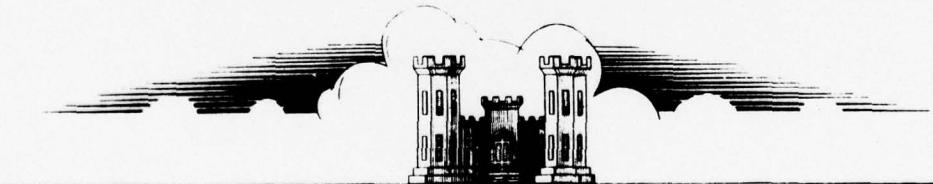
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Jun 78

⑰ 60P.

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PA-461



PREPARED FOR

DEPARTMENT OF THE ARMY  
BALTIMORE DISTRICT, CORPS OF ENGINEERS  
BALTIMORE, MARYLAND 21203

BY

D'APPOLONIA CONSULTING ENGINEERS  
10 DUFF ROAD

PITTSBURGH, PA. 15235

JUNE 1978

DDC  
DEPARTMENT OF DEFENSE  
JAN 31 1979  
D'APPOLONIA  
CONSULTING  
ENGINEERS  
10 DUFF ROAD  
PITTSBURGH, PA. 15235

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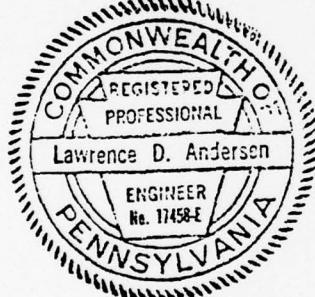
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PHASE I REPORT  
NATIONAL DAM INSPECTION PROGRAM

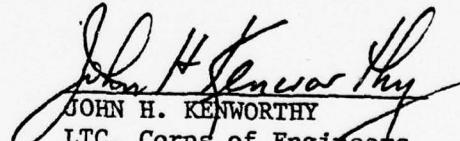
NAME OF DAM: Big Spring Dam  
STATE LOCATED: Pennsylvania  
COUNTY LOCATED: Westmoreland  
STREAM: Big Spring Run, tributary of Conemaugh River  
DATE OF INSPECTION: April 26 and May 4, 1978

ASSESSMENT: Based on the evaluation of the conditions as they existed on the dates of inspection and as revealed by visual observations, the condition of Big Spring Dam is assessed to be good. The spillway capacity is classified to be "seriously inadequate" (29 percent PMF). Failure resulting from overtopping would significantly increase the damage potential from that which would exist just before overtopping failure.

  
Lawrence D. Andersen, P.E.  
Vice President



APPROVED BY:

  
JOHN H. KENWORTHY  
LTC, Corps of Engineers  
Acting District Engineer  
DATE: 17 Jun 1978

BIG SPRING DAM  
NDS I.D. NO. 461  
APRIL 26, 1978



Upstream Face



Downstream Face

PHASE I REPORT  
NATIONAL DAM INSPECTION PROGRAM  
BIG SPRING DAM  
NDS I.D. No. 461

SECTION 1  
PROJECT INFORMATION

1.1 General

a. Authority. The inspection was performed pursuant to the authority granted by The National Dam Inspection Act, Public Law 92-367, to the Secretary of the Army, through the Corps of Engineers, to conduct inspections of dams throughout the United States.

b. Purpose. The purpose of this inspection is to determine if the dam constitutes hazard to human life or property.

1.2 Description of Project

a. Dam and Appurtenances. The dam consists of an earth embankment 1000 feet long, with a maximum height of 43 feet from the downstream toe. The combined primary and emergency spillway is located on the left abutment (looking downstream). The flow through the chute spillway is controlled by a broad-crested weir almost 20 feet wide at an elevation approximately 5 feet below the dam crest. The spillway chute is a 5-foot-deep rectangular channel with masonry walls and concrete bottom which discharges into the plunge pool. The outlet works consist of a 20-inch-diameter cast-iron "blow-off" pipe and a 20-inch-diameter cast-iron supply line located approximately midway between the abutments. Discharge through the pipe is controlled by valves located in a valve chamber at the toe of the dam. The blow-off valve constitutes the emergency drawdown facility for the dam. The dam impounds 128.8 acre-feet of water at normal pool elevation.

b. Location. Big Spring Dam is located two miles upstream on Big Spring Run, a tributary of the Conemaugh River, two miles southeast of Seward in St. Clair Township, Westmoreland County, Pennsylvania (Plate 1). The impounded reservoir serves as a domestic water supply source.

Downstream from the dam, Big Spring Run flows through a steep and narrow wooded valley over a distance of a half mile, then the stream

valley widens into the Conemaugh River valley at the southern end of the town of Seward. The stream flows under State Route 711 (Photograph 8) and the Penn Central Railroad tracks (Photograph 16) about 1000 feet upstream from its confluence with the Conemaugh River. The railroad embankment is estimated to be about 35 feet above the streambed and 15 feet above State Route 711. This railroad bridge together with the bridge on State Route 711 will constitute a major constriction to the flow in the event of failure of the dam, and backwater may significantly damage a gasoline storage tank near State Route 711 and may cause partial flooding of a small shopping center and several homes at the southern end of the town of Seward (Plate 1).

c. Size Classification. Intermediate (based on 43-foot height).

d. Hazard Classification. High.

e. Ownership. High Ridge Water Supply Company.

f. Purpose of Dam. Water supply.

g. Design and Construction History. The dam was designed and constructed by the American Pipe and Manufacturing Company, Philadelphia, Pennsylvania, during 1906 and 1907.

h. Normal Operating Procedure. The reservoir is normally maintained at spillway crest level of Elevation 1380, leaving five feet of freeboard at the top of the masonry wall along the crest of the dam. All inflow occurring when the reservoir is at or above the spillway elevation is discharged through the spillway.

### 1.3 Pertinent Data

a. Drainage Areas - 1.16 square miles.

b. Discharge at Dam Site

Maximum known flood at dam site - Unknown.

Warm water outlet at pool elevation - N/A.

Diversion tunnel low pool outlet at pool elevation - N/A.

Diversion tunnel outlet at pool elevation - N/A.

Gated spillway capacity at pool elevation - N/A.

Gated spillway capacity at maximum pool elevation - N/A.

Ungated spillway capacity at maximum pool elevation - 609 cfs.

Total spillway capacity at maximum pool elevation - 609 cfs.

c. Elevations (USGS Datum)

Top of dam - 1385 feet.

Maximum pool-design surcharge - Unknown.

Full flood control pool - N/A.  
Recreation pool - N/A.  
Spillway crest - 1380 feet.  
Upstream portal invert diversion tunnel - N/A.  
Downstream portal invert diversion tunnel - N/A.  
Streambed at center line of dam - 1340 feet.  
Maximum tailwater - 1343 feet (estimated).

d. Reservoir

Length of maximum pool - 1200 feet.  
Length of recreation pool - N/A.  
Length of flood control pool - N/A.

e. Storage

Recreation pool (normal pool) - 128.8 acre-feet.  
Flood control pool - N/A.  
Design surcharge (maximum) - 32 acre-feet.  
Top of dam - 161 acre-feet.

f. Reservoir Surface

Top of dam - 6.7+ acres.  
Maximum pool - 6.7+ acres.  
Flood control pool - N/A.  
Recreation pool - N/A.  
Spillway crest - 6.7 acres.

g. Dam

Type - Earth.  
Length - 1000 feet.  
Height - 43 feet.  
Top width - 20 feet.  
Side slopes - 2H:1V (upstream); 1.5H:1V (downstream).  
Zoning - Yes.  
Impervious core - Yes.  
Cutoff - Yes.  
Grout curtain - Yes.

h. Diversion and Regulating Tunnel

Type - 20-inch-diameter cast iron.  
Length - Unknown.  
Closure - N/A.  
Access - N/A.  
Regulating facilities - Valve.

i. Spillway

Type - Broad-crested weir.  
Length of weir - 19'-9" (as measured).  
Crest elevation - 1380 feet.  
Gates - N/A.  
Upstream channel - Lake.  
Downstream channel - Natural stream.

SECTION 2  
ENGINEERING DATA

2.1 Design

a. Data Available

(1) Hydrology and Hydraulics. A state inspection report entitled, Report Upon the Big Spring Dam, dated October 30, 1914, summarizes the hydrologic and hydraulic data which are available for the project. The report states the criteria used for the design of the spillway.

(2) Embankment. The available information includes a limited number of design drawings and various past state inspection reports.

(3) Appurtenant Structures. No design information is available.

b. Design Features

(1) Embankment. A review of design drawings and the correspondence files for the dam show the following main features of the project:

(a) As designed, the dam is essentially a homogeneous embankment with a "puddle" clay cut-off wall at the upstream toe of the dam. In the design drawings, two different zones were identified (Plate 2): "selected material rolled" in the upstream half of the embankment and "material rolled" in the downstream half of the embankment.

(b) The embankment was designed to have a two to one (horizontal to vertical) slope on the upstream face and a 1.5 to 1 downstream slope (Plate 2). Both the downstream and upstream faces of the crest were protected by 12-inch hand-placed riprap with the surface broken to 3-inch size.

(c) In the 1914 report, the cutoff wall was described as follows:

"Near the upstream toe a clay puddle cut-off wall, 6 feet thick, was carried to a varying depth of from 10 to 40 feet. The puddle wall was carried well into the hill-sides at the ends of the dam, at the left end passing beneath the spillway floor. It

was believed at the time of construction that this wall extended to impervious material."

(d) In the same reference, it was reported that the subsurface investigation was made by means of borings and test pits. Plate 3 illustrates the subsurface profile of the valley derived from the foundation investigation. It consists of "yellow clay and stones" varying in thickness from 5 to 35 feet, underlain by shale on the east side of the valley and limestone on the west side of the valley. A 5-foot coal seam is shown on the east abutment side at an elevation of 1355 feet, which is approximately 30 feet below the dam crest. An old mine opening is reported on the west abutment at an elevation of 1345 feet. The subsurface profile through the valley indicates that the foundation of the puddle trench was grouted.

(2) Appurtenant Structures. The appurtenant structures for the dam consist of an uncontrolled spillway and outlet works. The spillway structures consist of a broad-crested weir spillway, a discharge channel, and a plunge pool. The outlet works consist of 20-inch supply lines and a 20-inch blow-off pipe. Descriptions of the appurtenant structures are included in Section 1.2.

c. Design Data

(1) Hydrology and Hydraulics. The 1914 report stated that the spillway was designed for an inflow of 400 cubic feet per second per square mile of watershed. The spillway capacity as designed was reported to be 464 cfs with no freeboard.

(2) Embankment. No data are available on the design of the embankment.

(3) Appurtenant Structures. There are no design values available for the appurtenant structures.

2.2 Construction. Limited construction drawings and various state inspection reports were available for review.

In the 1914 inspection report, it was reported that the embankment was understood to have been placed in thin layers sprinkled and rolled with a horse roller. It is also reported that the embankment foundation was cleared of boulders and vegetation prior to construction.

The 1914 inspection report also stated that the dam developed significant seepage through the left side of the embankment following its completion. In April 1909, the reservoir was drained and repairs were made. The repairs included construction of a 2.5-foot-thick concrete cutoff wall at the left end of the embankment. The wall was backed with a "puddle clay" fill. Plate 4 shows the extent of this cutoff wall and shows that permeable layers below the bottom of the wall were cement grouted.

2.3 Operation. There are no formal operating records available for this dam. As designed, the dam serves as a water supply reservoir. The supply water from the reservoir discharges through a 20-inch pipe, controlled by valves located in the valve chamber at the toe of the dam and joins the transmission system. The 20-inch "blow-off" pipe is also controlled by a valve in this valve chamber. The "blow-off" pipe discharges into Big Spring Run through a riprapped channel approximately 200 feet downstream from the toe of the dam.

2.4 Other Investigations. The available information indicated no investigations other than the reports of periodic inspections conducted by the state.

#### 2.5 Evaluation

a. Availability. Available engineering data were provided by PennDER.

b. Adequacy

(1) Hydrology and Hydraulics. The available information is limited to providing the design capacity of the spillway.

(2) Embankment. Review of the geotechnical aspects of the design indicates that in view of the age of the dam, completed in 1907, the design approach and construction techniques are not likely to be in conformance with currently accepted engineering practice. Design documents lack such considerations as embankment slope stability and seepage analyses, usually included in current practice.

However, the design incorporated such basic components as a cutoff trench extending to impervious materials, foundation grouting, and riprap protection of the crest and the downstream slope.

(3) Appurtenant Structures. Review of design drawings indicates that there are no significant design deficiencies that should affect the overall performance of the appurtenant structures.

c. Operating Records. No formal operating records are available for this dam.

d. Post-Construction Changes. As described in Section 2.2, shortly after the completion of the dam, the reservoir was drained and the seepage condition observed on the left abutment was corrected by the construction of a concrete cutoff wall.

In the field, a masonry wall was found to have been built along the crest from the right side of the spillway channel to the right abutment. The top of the wall is about one foot above the crest of the dam. No reference was found to indicate when or for what purpose this wall was built. It is assumed that the purpose of this wall was to increase the freeboard for the dam, thereby increasing the flood discharge capacity of the dam.

SECTION 3  
VISUAL INSPECTION

3.1 Findings

a. General. The on-site inspection of Big Spring Dam consisted of:

1. Visual inspection of the embankment, abutments, and embankment toe.
2. Visual examination of the spillway and its components, the downstream end of the outlet pipe, and other appurtenant features.
3. Observation of factors affecting the runoff potential of the drainage basin.
4. Evaluation of downstream area hazard potential.

The specific observations are illustrated in Plate 5 and in the photographs in Appendix C.

b. Embankment. The general inspection of the embankment consisted of searching for indications of structural distress, such as cracks, subsidence, bulging, wet areas, seeps and boils, and observing general maintenance conditions, vegetative cover, erosion, and other surficial features.

1. Two wet areas were observed at the toe of the dam (Plate 5): one to the right of the spillway channel and another to the right of the center of the embankment. No perceivable seepage was associated with these wet areas.
2. Minor seepage was observed on the left abutment draining into the streambed approximately 50 feet downstream of the plunge pool.
3. The outlet channel of the "blow-off" pipe was noted to be partially obstructed with fallen trees and other debris.

c. Appurtenant Structures. The spillway structures, spillway crests, channels, and plunge pools were examined for deterioration or other signs of distress and obstructions that would limit flow. In general, the structures were found to be in good condition. The plunge pool was examined and scouring and erosion were observed (Photograph 5).

The downstream end of the outlet pipe was examined and was found to be in fair condition.

d. Reservoir Area. The watershed is predominantly covered with woodlands and infiltration capacity is estimated to be good. There appeared to be no major land clearing activities or other operations that would significantly increase the runoff rate of the drainage basin.

The shorelines are not considered to be susceptible to massive landslides which would affect the storage volume of the reservoir or cause overtopping of the dam by displaced water.

e. Downstream Channel. Big Spring Run, for most of its course, flows through a rocky, steep streambed. The bridges over the stream are shown in Photographs 8 and 9. Sketches of the bridges are included in Appendix A. A description of the downstream channel is included in Section 1.2.

3.2 Evaluation. In general, the condition of the dam is considered to be good. A review of previous inspection reports revealed that, following completion of the remedial work in 1909 to stop seepage on the left side of the dam, seepage was reported in the same general area in 1919.

## SECTION 4 OPERATIONAL FEATURES

4.1 Procedures. Review of the design drawings and field observations indicate that there are no formal procedures for operating the dam. The operational feature of the dam which may affect the safety of the dam is the outlet pipe valve, in case it is required to lower the reservoir.

The clearing of debris from the spillway as required and the continued inspection of the facilities by the dam tender are the principal maintenance operations which would affect safety.

4.2 Maintenance of the Dam. The overall maintenance conditions of the dam appear satisfactory.

4.3 Maintenance of Operating Facilities. On the date of the field inspection, the water company was drawing water from the reservoir into the distribution system and preferred not to operate the blow-off to avoid any interference with this operation. However, the water company manager reported that the "blow-off" valve was operational.

4.4 Warning System in Effect. No flood warning system exists for Big Spring Dam. The dam tender resides approximately 8 miles south of the dam at the site of Tubmill Dam. No communication facilities are available at or near the site of Big Spring Dam.

4.5 Evaluation. The dam is satisfactorily maintained, and it is considered to be accessible under all weather conditions for inspection and emergency action purposes.

## SECTION 5 HYDRAULICS AND HYDROLOGY

### 5.1 Evaluation of Features

a. Design Data. Big Spring Dam has a watershed area of 1.16 square miles and impounds a reservoir with a surface area of 6.7 acres. A 20-foot-wide by 5-foot-deep chute spillway constitutes both the primary and emergency spillway for the impoundment. Flow through the spillway is controlled by a broad-crested weir. As it exists, the spillway has a maximum discharge capacity of 609 cfs with no freeboard.

b. Experience Data. Big Spring Dam is classified to be an "intermediate" size dam in the "high" hazard category. Under the recommended criteria for evaluating emergency spillway discharge capacity such impoundments are required to pass the probable maximum flood (PMF).

The adequacy of the spillway was analyzed based on the simplified procedure developed by the Baltimore District, Corps of Engineers. Based on this procedure, it was determined that the PMF inflow hydrograph will have a peak flow of 2200 cfs and a total volume of approximately 2764 acre-feet. Both of these values are greater than the spillway capacity of 609 cfs and the flood storage volume of 32.1 acre-feet, respectively. Therefore, the spillway is not capable of passing the PMF flow without overtopping. Further analysis, according to the procedure, indicated that the spillway can pass a maximum flow of approximately 29 percent of the PMF without overtopping.

c. Visual Observations. On the date of inspection, no conditions were observed that would indicate that the spillway of the dam could not operate satisfactorily in the event of a flood.

d. Overtopping Potential. As stated above, the dam will be overtopped during a flood whose magnitude exceeds 29 percent PMF.

e. Spillway Adequacy. As previously stated, the capacity of the spillway is less than 50 percent PMF. It was further calculated that just prior to overtopping, the maximum flow from the spillway will essentially be contained within the stream channel. Therefore, a failure resulting from overtopping would significantly increase the damage potential from that which would exist just before overtopping failure.

Based on the above results, the spillway is classified to be "seriously inadequate" based on the recommended criteria.

## SECTION 6 STRUCTURAL STABILITY

### 6.1 Evaluation of Structural Stability

a. Visual Observations. As discussed in Section 3, the field observations did not reveal any signs of distress that would significantly affect the stability of the dam and none were reported in the past after the repairs in 1909.

#### b. Design and Construction Data

(1) Embankment. The dam was designed at a time (1907) when limited understanding of the geotechnical behavior of earth structures existed. Consequently, the available design and construction information includes limited quantitative data to aid in the assessment of embankment stability.

(2) Appurtenant Structures. Review of the design drawings indicates that the supply and "blow-off" lines are controlled by valves located at the downstream side of the dam; therefore, they are constantly under pressure. The available design drawings show that these lines were encased in concrete. However, the thickness of the concrete was not specified.

c. Operating Records. The structural stability of the dam is not considered to be affected by the operational features of the dam.

d. Post-Construction Changes. Reported repair work on the left abutment side of the embankment, intended to control the seepage through that side, appears to be satisfactorily functioning. No seepage was observed in this area.

SECTION 7  
ASSESSMENT AND RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment

a. Safety. The visual observations and review of available information indicate that Big Spring Dam is in good condition. It appears that the dam was constructed with reasonable care. Field observations did not reveal any significant signs of distress and none were reported in past inspections after 1909.

The spillway was considered to be "seriously inadequate" in view of its capacity (29 percent PMF) being less than 50 percent PMF and a dam failure would significantly increase the hazard potential which existed just prior to overtopping.

b. Adequacy of Information. The available information in conjunction with visual observations and previous experience of the inspectors are considered to be sufficient to make a reasonable assessment of the dam.

c. Urgency. More detailed evaluation of the spillway should be made immediately and other recommendations below should be implemented as soon as practicable or on a continuing basis.

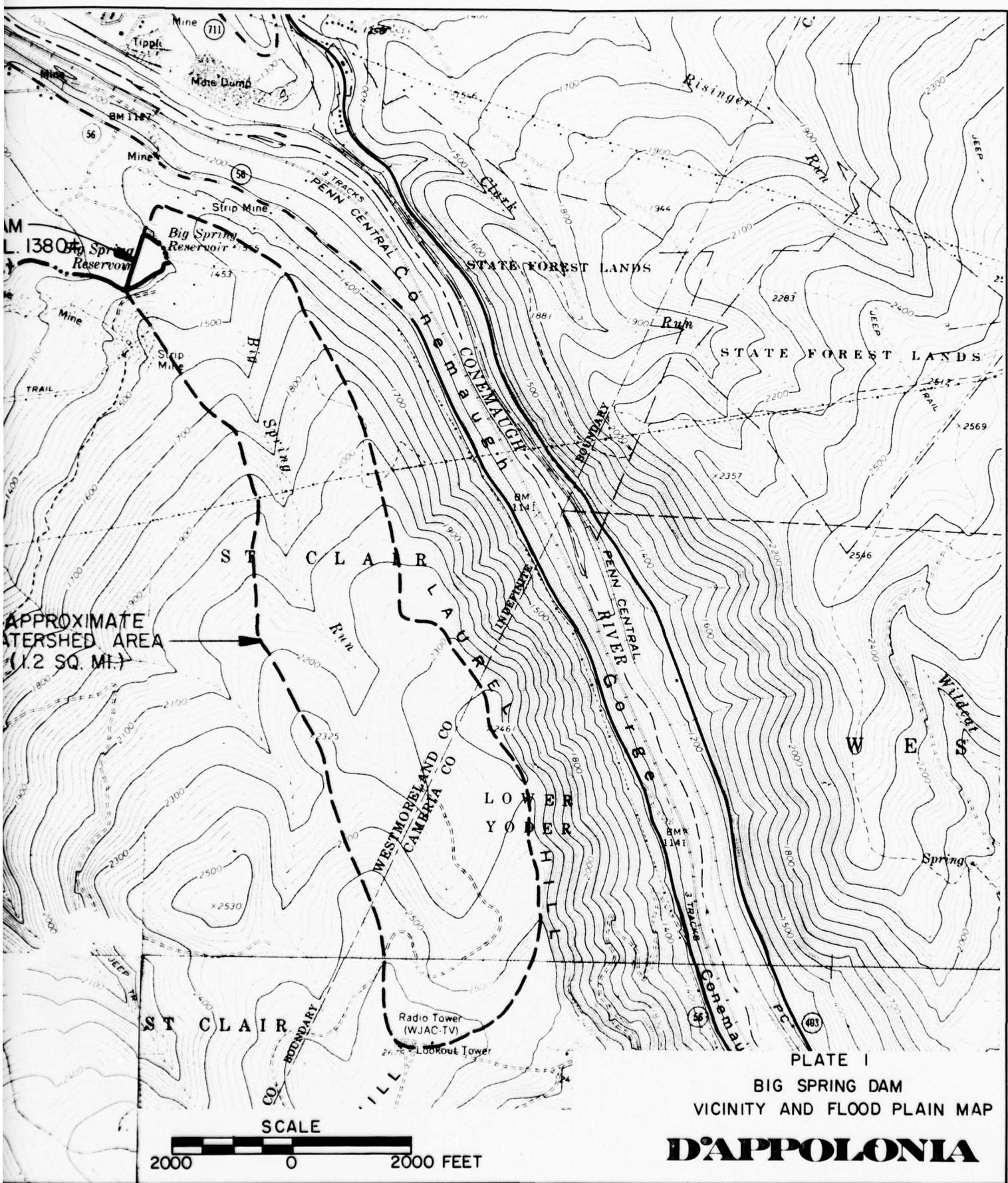
d. Necessity for Further Investigation. The condition of the spillway is considered to require further investigation. The embankment is considered to require no further investigation.

7.2 Recommendations/Remedial Measures

1. The owner should initiate additional studies to more accurately ascertain the spillway capacity and nature and extent of mitigation measures required.
2. Since the adequacy of the concrete casing around the pipes through the embankment could not be reliably assessed, the owner should evaluate the structural integrity of the pipes and the casing and investigate the need for placing upstream controls on these pipes.
3. It is recommended that the owner be advised that the dam and appurtenant structures should be inspected regularly by the dam tender and any unusual conditions should be reported to the appropriate authorities.

PLATES



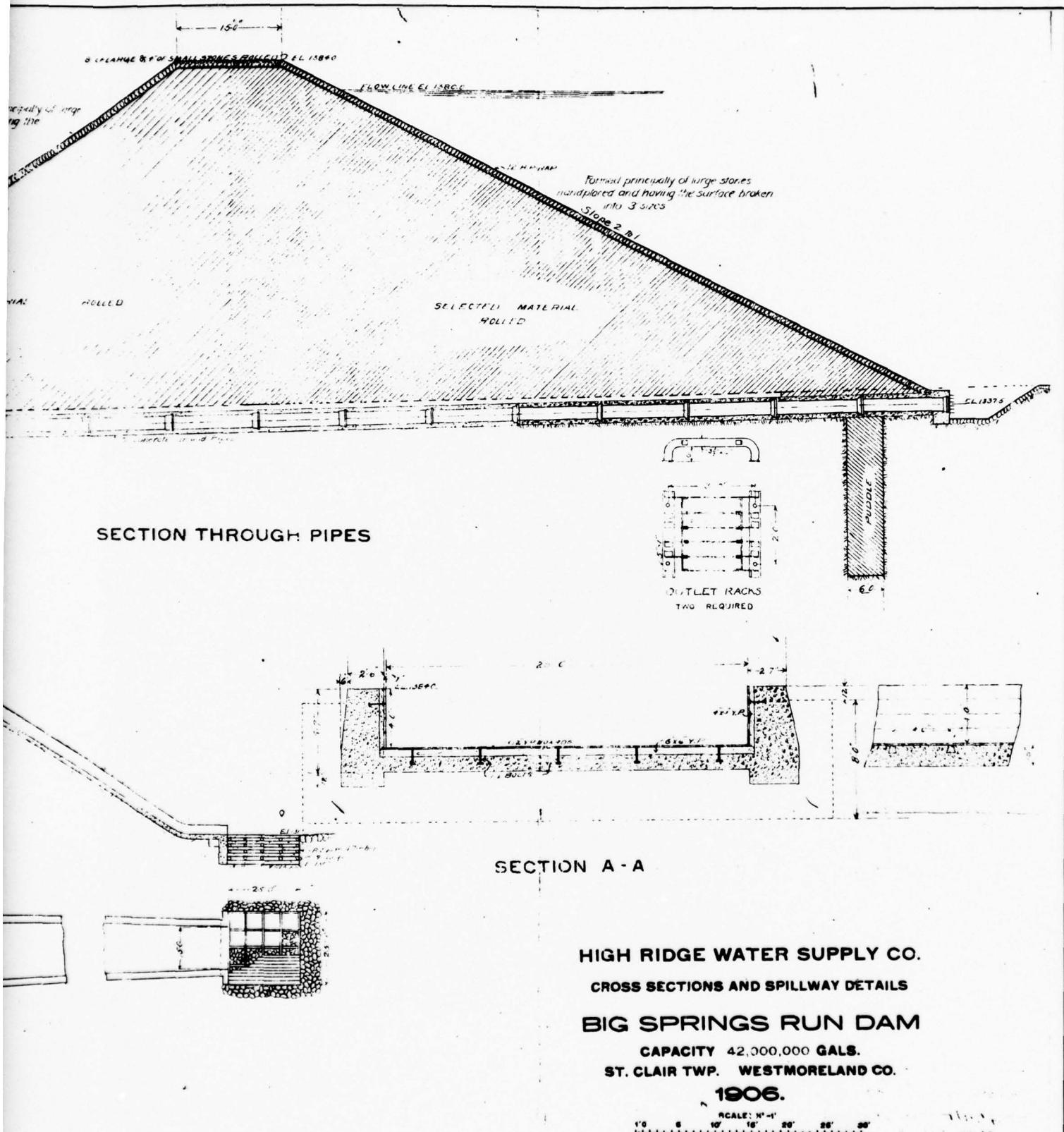


BIG SPRING DAM  
VICINITY AND FLOOD PLAIN MAP

# D'APPOLONIA

2





ION OF SPILLWAY

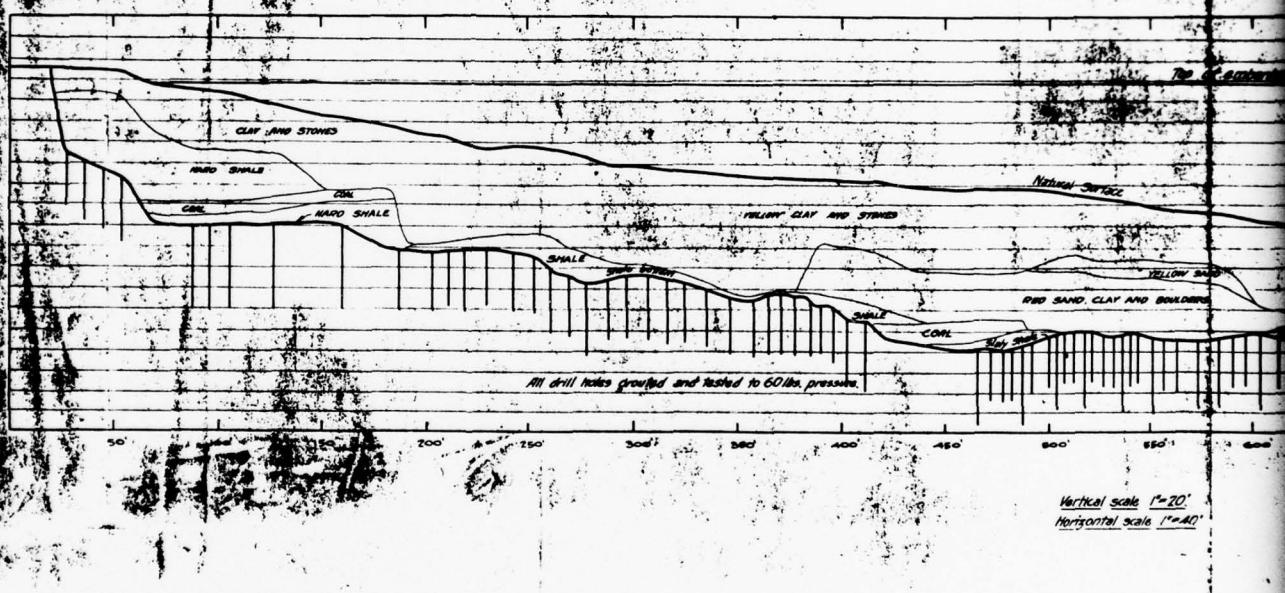
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HIGH RIDGE WATER SUPPLY CO.  
 GEOLOGICAL SECTION OF PUDDLE TRENCH  
 BIG SPRINGS DAM  
 SAINT CLAIR TOWNSHIP WESTMORELAND COUNTY, PENNA

1906

Section along Puddle Trench, look



Puddle French, looking up-stream.

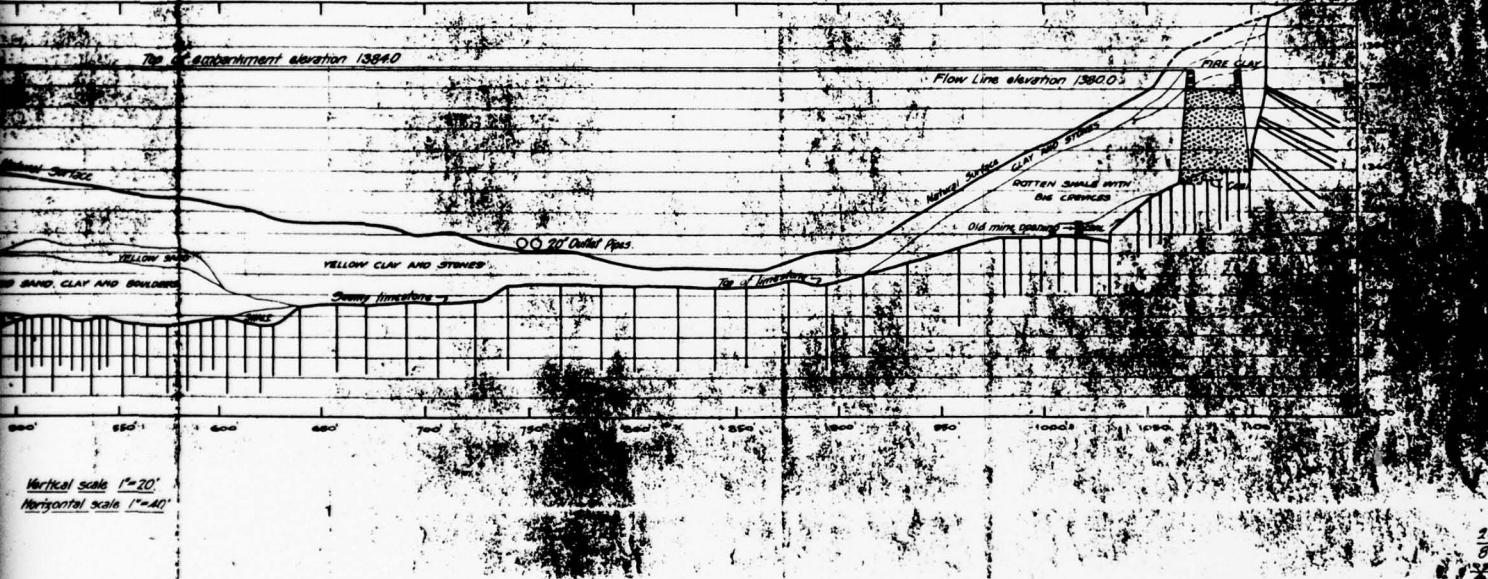


PLATE 3

D'APPOLONIA

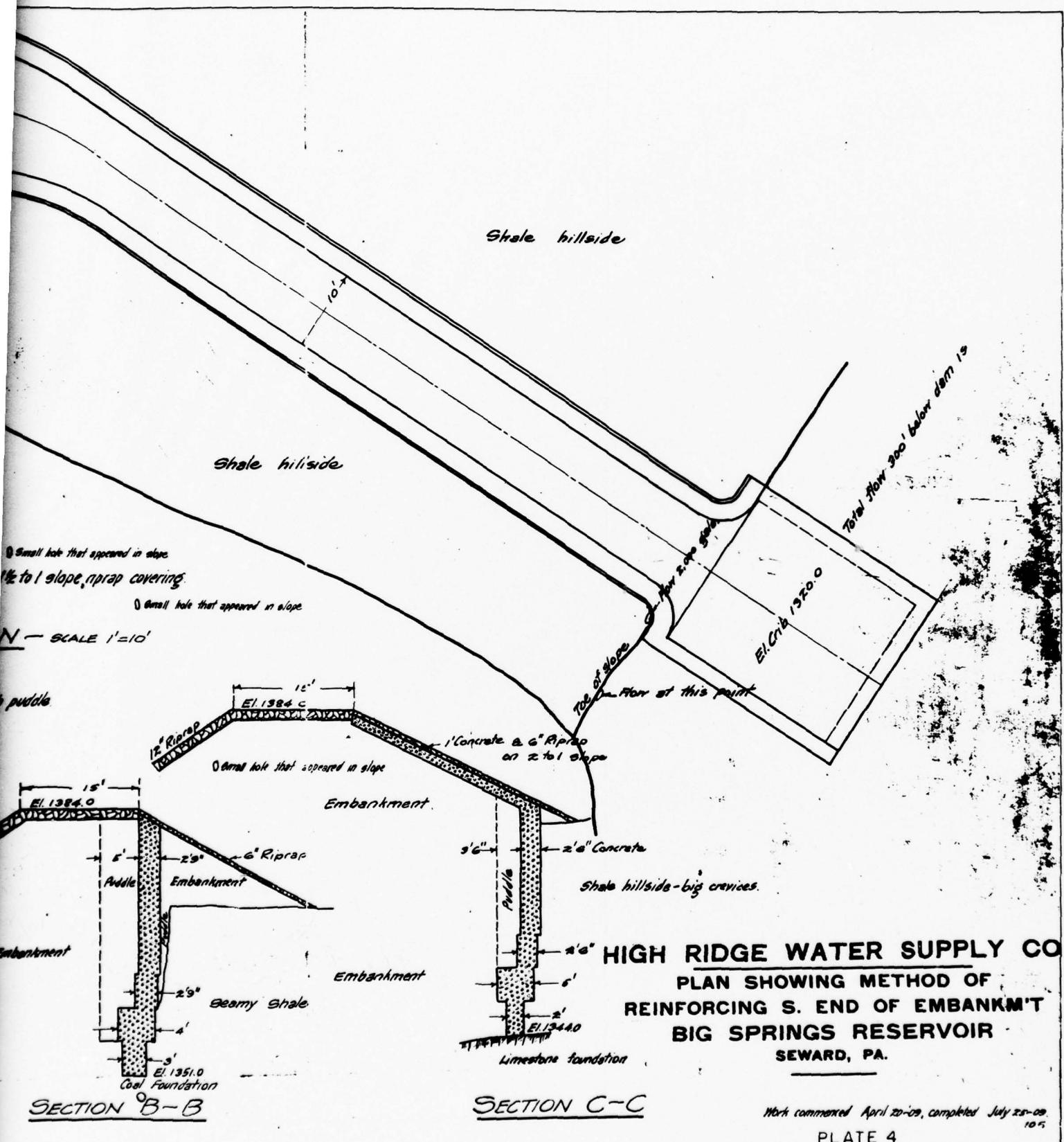
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DRAWN BY 5-2-78 CHECKED BY BE DRAWING 5-11-78  
APPROVED BY JHD NUMBER 78-114-B21

A hand-drawn cross-section diagram of a shale hillside. The diagram shows a vertical shale hillside on the right and a horizontal trench on the left. The trench is labeled "End of trench" and contains several small circles representing injection points. A line labeled "2" 1/2" Pipes, 220 sacks cement or 6600 gals grout pumped" extends from these points. A line labeled "E1 flow line 1380.0" runs parallel to the trench. A dashed line labeled "Edge of cut off trench" extends from the end of the trench. A curved line labeled "Ground under grouting" is shown below the trench. A vertical line labeled "Concrete" is shown on the right. A vertical scale on the right indicates depths of 10, 15, and 20.

SECTION A-A

SECTION B-B



**HIGH RIDGE WATER SUPPLY CO.**  
PLAN SHOWING METHOD OF  
REINFORCING S. END OF EMBANKM'T  
BIG SPRINGS RESERVOIR  
SEWARD, PA.

SECTION B-B

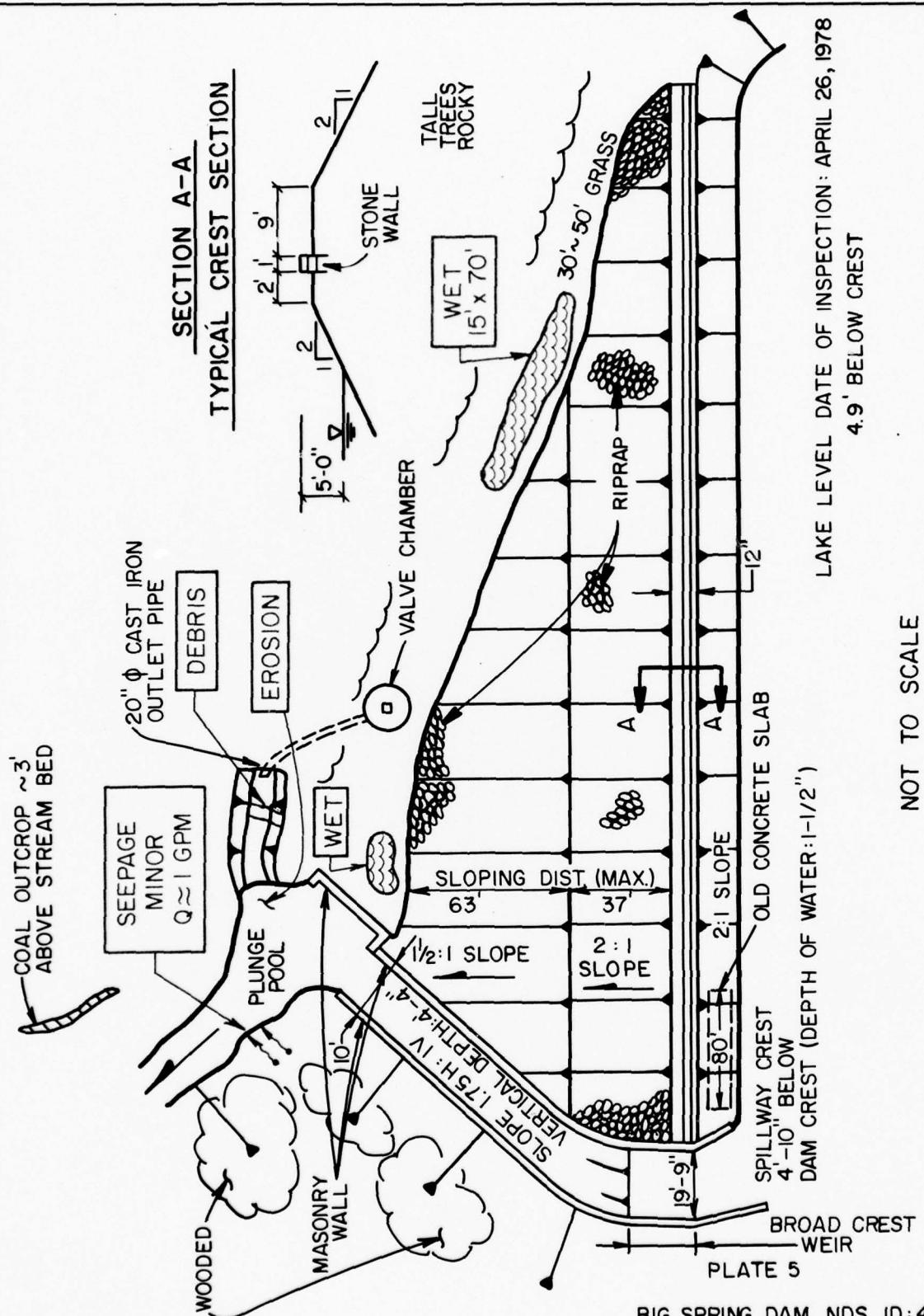
SECTION C-C

Work commenced April 20-09, completed July 25-09.  
105

**D'APPOLONIA**

DRAWN BY	G.J.G.	CHECKED BY	BE	5-11-78	DRAWING
	5-2-78	APPROVED BY	JHP	5-11-78	NUMBER 78-4-A3

SECTION A-A  
TYPICAL CREST SECTION



LAKE LEVEL DATE OF INSPECTION: APRIL 26, 1978  
4.9' BELOW CREST

NOT TO SCALE

BIG SPRING DAM NDS ID: 461  
GENERAL PLAN  
FIELD INSPECTION NOTES  
FIELD INSPECTION DATE: APRIL 26, 1978

**D'APPOLONIA**

APPENDIX A  
CHECKLIST, VISUAL INSPECTION  
PHASE I

**CHECKLIST  
VISUAL INSPECTION  
PHASE I**

NAME OF DAM BIG SPRING DAM COUNTY WESTMORELAND STATE PA ID# NDS:461 DEP:65-4  
 TYPE OF DAM EARTH FILL HAZARD CATEGORY HIGH.  
 DATE(S) INSPECTION 4/26/78 WEATHER PRTLY CLOUDY TEMPERATURE 50°

POOL ELEVATION AT TIME OF INSPECTION ~ 379 M.S.L. TAILWATER AT TIME OF INSPECTION ~ 340 M.S.L.

## INSPECTION PERSONNEL:

BILGIN EREL WAH-TAK CHAN REVIEW INSPECTION BY: (5-4-78) Elio D'Appolonia, LAWRENCE ANDERSEN James Daniel O'T

# RECORDED BILGIN EREL:

NAME OF DAM BIG SPRING DAM  
PHASE I  
EMBANKMENT

ID# 461 D# 65-4

VISUAL INSPECTION  
PHASE I  
EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	NONE FOUND.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	NONE FOUND.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	NONE FOUND.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	NO PERCEIVABLE MISALIGNMENT.	
RIPRAP FAILURES	NONE	

VISUAL INSPECTION PHASE I EMBANKMENT		NAME OF DAM <u>BIG SPRING DAM</u> ID# NDS:461 PER:65-4	
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	NO VISUAL SIGNS OF DISTRESS. MINOR SEE PAGE ON LEFT ABUTMENT AT ABOUT TOE ELEVATION, 20 ~ 30' DOWN STREAM FROM PLUNGE POOL.		
ANY NOTICEABLE SEEPAGE	NONE ON THE EMBANKMENT.		
STAGE GAGE AND RECORDER	NONE		
DRAINS	NONE FOUND.		

NAME OF DAM BIG SPRING DAM  
 PHASE I  
 CONCRETE/MASONRY DAMS  
IDF NDS:4G1, DEP:GS-4

VISUAL INSPECTION		REMARKS OR RECOMMENDATIONS
VISUAL EXAMINATION OF	OBSERVATIONS	
ANY NOTICEABLE SEEPAGE	( EARTH FILL DAM ) .. N/A	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS		N/A
DRAINS		N/A
WATER PASSAGES		N/A
FOUNDATION		N/A.

VISUAL INSPECTION PHASE I CONCRETE/MASONRY DAMS		NAME OF DAM <u>BIG SPRING DAM</u> ID# <u>NDS: 461</u> , <u>DCP: GS-4</u>	
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS	
SURFACE CRACKS CONCRETE SURFACES	(EARTHFILL DAM)  ∴ N/A.		
STRUCTURAL CRACKING		N/A	
VERTICAL AND HORIZONTAL ALIGNMENT		N/A	
MONOLITH JOINTS		N/A	
CONSTRUCTION JOINTS STAFF GAGE OF RECORDER:		N/A.	

NAME OF DAM BIG SPRING DAM  
 PHASE 1  
 OUTLET WORKS

ID# NDS: 461 , DE# : 65-4

VISUAL EXAMINATION OF	OBSERVATIONS		REMARKS OR RECOMMENDATIONS
	OUTLET PIPE	CAST IRON 20"φ . ONLY OUTLET END VISIBLE .	
INTAKE STRUCTURE	SUBMERGED NOT VISIBLE .		
OUTLET STRUCTURE	OUTLET CONDUIT DISCHARGES DIRECTLY INTO OUTLET CHANNEL .		
OUTLET CHANNEL	OUTLET CHANNEL ~ 6FT WIDE ~ 3 FT DEEP . CHANNEL IS OBSTRUCTED WITH FALLEN TREES .		
EMERGENCY GATE	"BLOW-OFF" VALVE REPORTED TO BE OPERATIONAL BY THE HIGH RIDGE WATER SUPPLY CO. MANAGER MR. FRANK. E. CLAYCOMP. SEE SECTION 4.3 of REPORT.		

VISUAL INSPECTION		NAME OF DAM <u>Big Spring Dam</u> IDF NDS: 461, DEP: 65-4	
VISUAL EXAMINATION OF		OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	BROAD CRESTED WEIR .		
APPROACH CHANNEL	FREE OF DEBRIS . GOOD CONDITION .		
DISCHARGE CHANNEL	MASONRY SIDE WALLS , WITH CONCRETE FLOOR . GOOD CONDITION .		
BRIDGE AND PIERS	NONE .		

VISUAL INSPECTION		NAME OF DAM	BIG SPRING DAM
PHASE 1		ID#	NDS: 461, DEP: 65-4
GATED SPILLWAY			
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS	
CONCRETE SILL	( NO GATED SPILLWAY )  ., N/A.		
APPROACH CHANNEL		N/A	
DISCHARGE CHANNEL		N/A	
BRIDGE PIERS		N/A	
GATES AND OPERATION EQUIPMENT		N/A.	

VISUAL INSPECTION PHASE I INSTRUMENTATION		NAME OF DAM <u>BIG SPRING DAM</u> ID# <u>NDS:461</u> , <u>DER:65-4</u>	
VISUAL EXAMINATION OF	OBSERVATIONS	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	NONE FOUND.		
OBSERVATION WELLS	NONE FOUND.		
WEIRS	NONE FOUND.		
PIEZOMETERS	NONE FOUND.		
OTHER	NONE FOUND.		

VISUAL INSPECTION PHASE I RESERVOIR		NAME OF DAM <u>BIG SPRING DAM</u> ID# NPS : 461 DER : GS-4	
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS	
SLOPES	GENTLE SLOPES, ROCKY & WOODED.		
SEDIMENTATION	LAKE IS CLEAR. NO INDICATION OF UNUSUAL RATE OF SEDIMENTATION.		

NAME OF DAM BIG SPRING DAM  
ID# NDS:461, DER: 65-4

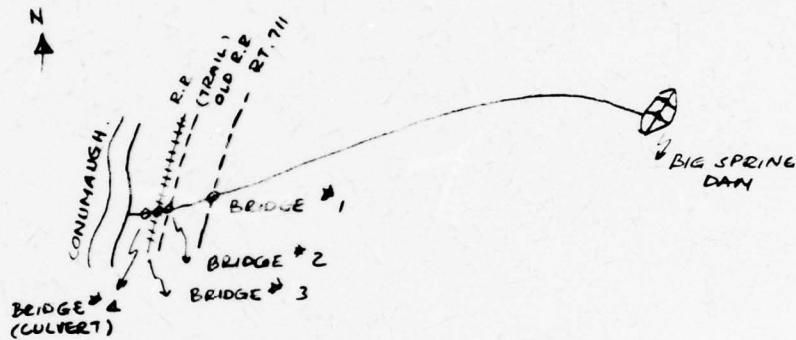
VISUAL INSPECTION  
PHASE 1  
DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF		OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	SLOPES		
Typical mountain stream channel occasional fallen trees. No major obstruction.	Rocky no significant erosion.		SEE PLATE 1
Approximate number of homes and population	One gasoline storage tank and an adjacent building. One shopping center stream crosses a state route. Pt 711. (shopping center @ ~Mile 1.6		

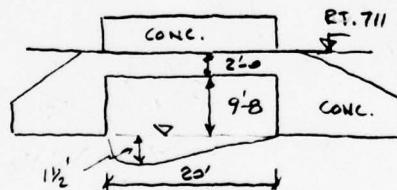
**D'APPOLONIA**  
CONSULTING ENGINEERS, INC

By BE Date 4/26/78 Subject BIG SPRING DAM DER ID 654 Sheet No. 1 of 1  
Chkd. By WTC Date 4/26/78 FIELD INSPECTION SKETCH Proj. No. 78-114-04

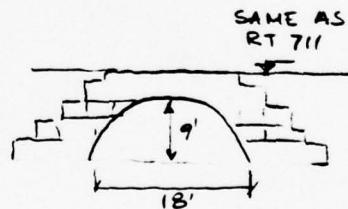
STREAM CROSS SECTIONS & BRIDGE LOCATIONS



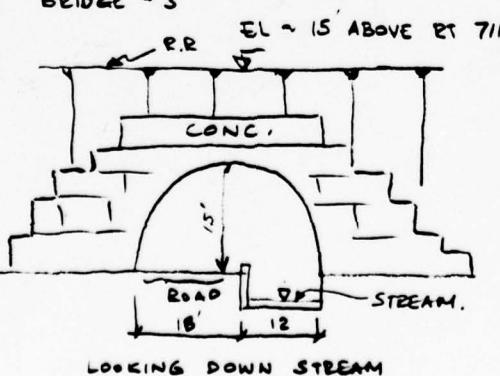
BRIDGE #1



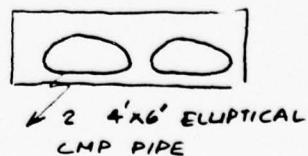
BRIDGE #2



BRIDGE #3



BRIDGE #4 (CULVERT)



LOOKING DOWN STREAM

APPENDIX B  
CHECKLIST, ENGINEERING DATA,  
DESIGN, CONSTRUCTION, OPERATION  
PHASE I

CHECKLIST  
 ENGINEERING DATA  
 DESIGN, CONSTRUCTION, OPERATION  
 PHASE I

NAME OF DAM BIG SPRING DAM  
 ID# NDS: 461, DER: 65-4

ITEM	REMARKS
AS-BUILT DRAWINGS	NOT AVAILABLE, MARKED AS DRAWING INCLUDED TO THE REPORT (PLATES 3 THRU 5)
REGIONAL VICINITY MAP	SEE PLATE - 1
CONSTRUCTION HISTORY	AS SUMMARIZED IN STATE INSPECTION REPORT DATED OCTOBER 30, 1914
TYPICAL SECTIONS OF DAM	SEE PLATE - 2
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS	<p>SEE PLATE - 2</p> <p>NOT AVAILABLE</p>

CHECKLIST  
 ENGINEERING DATA  
 DESIGN, CONSTRUCTION, OPERATION  
 PHASE I

NAME OF DAM BIG SPRING DAM  
 ID# NDS:461, DER:65-4

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	NOT AVAILABLE.
DESIGN REPORTS	NOT AVAILABLE.
GEOLOGY REPORTS	REPORT NOT AVAILABLE. PLATE-3 ILLUSTRATES SUBSURFACE PROFILE. (SOME DESCRIPTION IS INCLUDED IN A STATE INSPECTION REPORT DATED OCTOBER 30, 1914)
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	NOT AVAILABLE.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	NOT AVAILABLE.

CHECKLIST  
 ENGINEERING DATA  
 DESIGN, CONSTRUCTION, OPERATION  
 PHASE I

NAME OF DAM BIG SPRING DAM  
 ID# NDS: 461 DER: GS-4

ITEM	REMARKS
POST CONSTRUCTION SURVEYS OF DAM	NONE FOUND OTHER THAN STATE INSPECTION REPORT ON
BORROW SOURCES	UNKNOWN.
MONITORING SYSTEMS	NONE.
MODIFICATIONS	A CUT WALL WAS CONSTRUCTED AT THE LEFT ABUTMENT 1909 ( 2'-6" CONCRETE WALL EXTENDING DOWN TO ELEV. 1350, APPROXIMATELY 100 FT LONG FROM LEFT ABUTMENT UNDER THE SPILLWAY INTO THE EMBANKMENT)
HIGH POOL RECORDS	NOT AVAILABLE

CHECKLIST  
 ENGINEERING DATA  
 DESIGN, CONSTRUCTION, OPERATION  
 PHASE I

NAME OF DAM BIG SPRING DAM  
 ID# NDS: 461 , DEP: CS-4

ITEM	REMARKS
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	NONE FOUND OTHER THAN STATE INSPECTION REPORTS.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	NONE REPORTED. (IN 1927 INSPECTION AN "INCIDENT SLIDE" ON THE DOWN STREAM FACE WAS REPORTED. HOWEVER LATER IT WAS CONCLUDED THAT IT WAS A "SLIGHT ROLLING" OF RIPRAP RATHER THAN A SLOPE FAILURE.
MAINTENANCE OPERATION RECORDS	NOT AVAILABLE.
SPILLWAY PLAN	SEE PLATE . 4
SECTIONS	
DETAILS	
OPERATING EQUIPMENT PLANS AND DETAILS	SEE PLATE . 2

NAME OF DAM BIG SPRING DAM

ID# NDS: 461 , DER: 65-4

CHECKLIST  
HYDROLOGIC AND HYDRAULIC  
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: WOODLAND (1.2 SQ. MILES)

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 128.9 ACRE-FEET @ EL 1380

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): SAME AS ABOVE

ELEVATION MAXIMUM DESIGN POOL: 1380 (USGS DATUM - AS DESIGNED)

ELEVATION TOP DAM: 1384' (USGS DATUM - AS DESIGNED)

CREST:

a. Elevation 1384 (USGS DATUM)

b. Type RIPRAP

c. Width 15 FT (AS DESIGNED) 12-FT MEASURED

d. Length 1000 (AS DESIGNED)

e. Location Spillover NO VISIBLE LOW SPOTS.

f. Number and Type of Gates NO GATES.

OUTLET WORKS:

a. Type 20" Ø CAST IRON BLOW-OFF PIPE

b. Location THROUGH THE EMBANKMENT - MID WAY BETWEEN ABUTMENTS

c. Entrance Inverts CENTER OF PIPE EL 1337.6

d. Exit Inverts NOT AVAILABLE (ESTIMATED EL 1325')

e. Emergency Draindown Facilities BLOW-OFF PIPE

HYDROMETEOROLOGICAL GAGES:

a. Type NONE

b. Location N/A

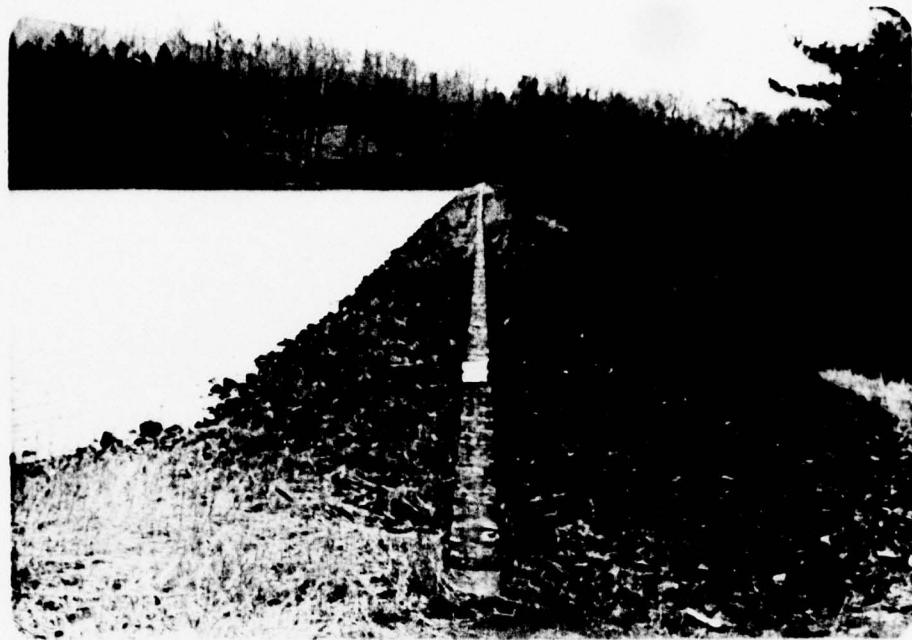
c. Records N/A

MAXIMUM NONDAMAGING DISCHARGE: ~1500 CFS > SPILLWAY CAPACITY  
(FLOOD PLAIN)

APPENDIX C  
PHOTOGRAPHS

LIST OF PHOTOGRAPHS  
BIG SPRING DAM  
NDS I.D. NO. 461  
APRIL 26, 1978

<u>PHOTOGRAPH NO.</u>	<u>DESCRIPTION</u>
1	Crest.
2	Downstream slope.
3	Spillway, approach channel and crest.
4	Spillway discharge channel.
5	Spillway plunge pool.
6	Stream channel downstream of plunge pool.
7	Outlet of "blow-off" pipe.
8	Bridge on Route 711 (Bridge No. 1).
9	Bridge on Penn-Central Railroad (Bridge No. 3).



Photograph No. 1  
Crest (looking west).



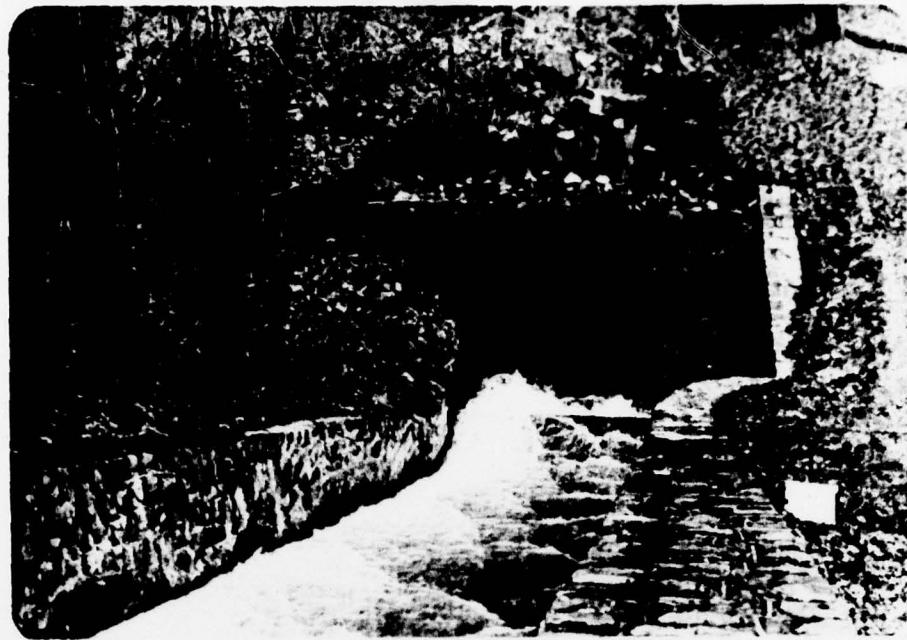
Photograph No. 2  
Downstream slope (looking east). Note gate chamber in  
middle of photograph.



Photograph No. 3  
Spillway, approach channel and crest.



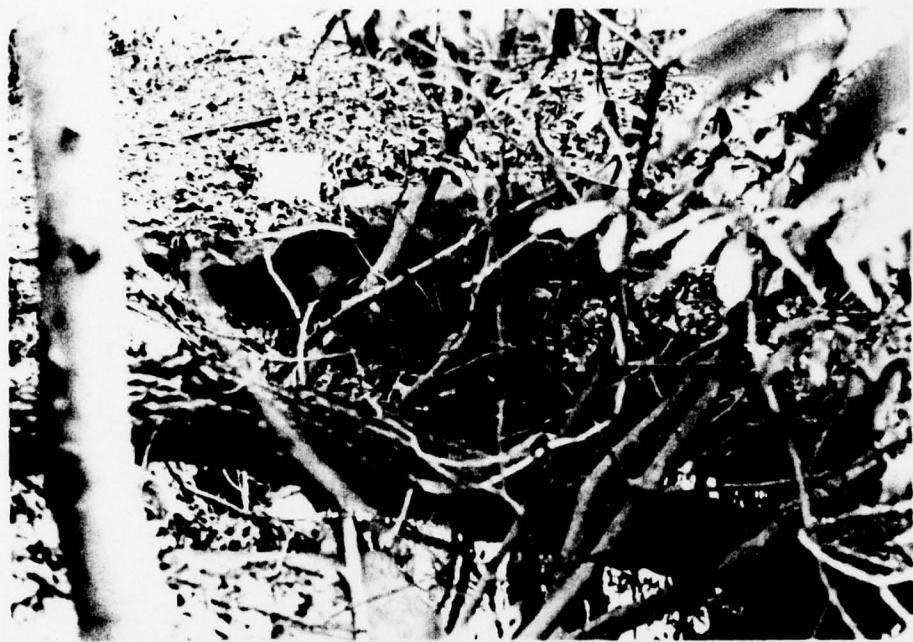
Photograph No. 4  
Spillway discharge channel.



Photograph No. 5  
Spillway plunge pool (note erosion).



Photograph No. 6  
Stream channel downstream of plunge pool.



Photograph No. 7  
Outlet end of "blow-off" pipe.



Photograph No. 8  
Bridge on Route 711 (Bridge No. 1).



Photograph No. 9

Bridge on Penn-Central Railroad (Bridge No. 3).  
Bridge on abandoned railroad bed (Bridge No. 2)  
background.

APPENDIX D  
CALCULATIONS

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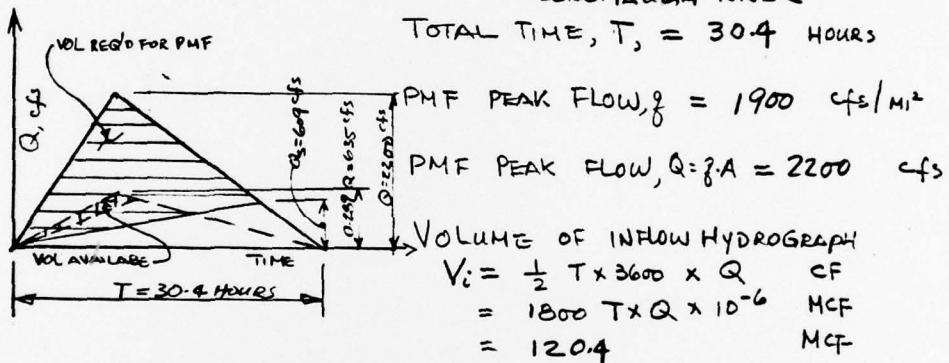
(1)

By WTC Date 4/29/78 Subject BIG SPRING RUN DAM NDS ID:461 Sheet No. 1 of 2  
Chkd. By BE Date 5-9-78 HYDROLOGY & HYDRAULIC Proj. No 7R-14-6J

DAM : BIG SPRING DAM, NDS ID : 461  
ST. CLAIR TOWNSHIP, WESTMORELAND COUNTY, PENN  
WATERSHED AREA, A: 1.16 SQ. MILE

INFLOW HYDROGRAPH : BASIN ; OHIO RIVER BASIN BIG SPRING RUN OF CONGHAUGH RIVER

TOTAL TIME,  $T = 30.4$  HOURS



SPILLWAY CAPACITY

TYPE ; BROAD CREST MASONRY  $C = 2.9$  USED IN ORIGINAL REPORT (assumed)

LENGTH  $L = 19'-9"$  (AS MEASURED DURING INSPECTION)

HEAD (MAX.)  $h = 4'-10"$  (AS " " " )

$$Q_s = C L h^{1.5} \text{ cfs}$$

$$= 609 \text{ cfs}$$

RESERVOIR CAPACITY,  $V_R = 6.7 \text{ ACRE (NORMAL POOL AREA)} \times 4'-10" (\text{FREEBOARD})$   
 $= 32.4 \text{ ACRE-FT} = 1.41 \times 10^6 \text{ FT}^3$

REQ'D RESERVOIR CAPACITY  $= \left(1 - \frac{\text{MAX. SPILLWAY CAPACITY}}{\text{PMF PEAK FLOW}}\right) (\text{VOLUME OF INFLOW})$

$$= \left(1 - \frac{Q_s}{Q}\right) (V_i) = \left(1 - \frac{609}{2200}\right) (120.4 \times 10^6)$$

$$= 87.1 \text{ MCF} > V_R = 1.41 \text{ MCF NG}$$

**DAIPIPOLONA**  
CONSULTING ENGINEERS, INC.

(2)

By WTC Date 4/28/78 Subject BIG SPRING RUN DAM DER ID #65 Sheet No. 2 of 2  
Chkd. By BE Date 5-9-78 HYDROLOGY & HYDRAULIC Proj. No. 78-114-03

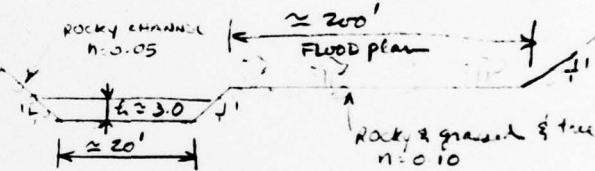
PERCENT OF PMF WITHOUT OVERTOPPING

$$= \frac{\left(\frac{609}{2200}\right)(20.4 \times 10^6) + 1.41 \times 10^6}{120.4 \times 10^6} \times 100\%$$

$$= 28.9\% \text{ PMF}$$

APPROXIMATE CROSS-SECTION OF FLOOD PLAIN @ 500 D/S

$$\text{APPROXIMATE CHANNEL SLOPE (FROM USGS)} = \frac{20}{290} = 0.07$$



$$A = (20 + h)(h) ; P = 20 + 2\sqrt{2} \times h \quad R = \frac{A}{P}$$

$$V = \frac{1.486}{0.05} R^{2/3} (0.07)^{1/2} = 7.8 R^{2/3}$$

$$Q = VA$$

f	CHANNEL					Flood Plain						
	A, ft <sup>2</sup>	P, ft	R, ft	V	Q	h'	A'	P'	R'	V'	Q'	Q <sub>max</sub>
0.1	2.01	20.28	0.10	1.67	3.4							
0.2	4.04	20.6	0.20	2.6	10.7							
0.5	10.25	21.41	0.48	4.8	99.0							
1.0	21.0	22.83	0.92	7.4	155.0							
1.5	32.25	24.24	1.33	9.4	304.5							
2.0	44.0	25.66	1.71	11.2	492.0							
2.5	56.3	27.1	2.08	12.7	715.0							
3	69.0	28.49	2.42	14.1	971.3	0	0	0	0	0		
3.5	82.3	29.9	2.75	15.3	1260	0.5	100.5	200	0.50	25	247	1507 8.3
4	96.0	31.3	3.07	16.5	1581	1.0	201	200	1.01	39	787	2368 8.0

APPENDIX E  
REGIONAL GEOLOGY

## APPENDIX E REGIONAL GEOLOGY

A preliminary review of the regional geology indicates that the site is located in the Allegheny Mountain section of the Appalachian Plateau province. The dam is on the west limb of the Laurel Hill Anticline, near its northern nose, and the east limb of the Ligonier Syncline. The rock strata dip approximately 750 feet per mile to the northeast. The bedrock contains members of the middle portion of the Allegheny Series, probably the Middle Kittanning Sandstone, the Lower Kittanning coal, and the Clarion Sandstone. The Vanport Limestone may be present in the area approximately 40 feet below the Lower Kittanning coal. The profile of the dam (Plate 3) indicates limestone being present in the bottom of the valley.